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July 24, 1998

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 379)

JULY 24, 1998

01
AERONAUTICS

19980137575 Logistics Management Inst., McLean, VA USA

Aviation System Analysis Capability Quick Response System Report ***Final Report, FY 1997***

Roberts, Eileen, Logistics Management Inst., USA; Villani, James A., Logistics Management Inst., USA; Ritter, Paul, Logistics Management Inst., USA; Apr. 1998; 104p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207663; NAS 1.26:207663; LMI-NS701S2; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The purpose of this document is to present the additions and modifications made to the Aviation System Analysis Capability (ASAC) Quick Response System (QRS) in FY 1997 in support of the ASAC ORS development effort. This document contains an overview of the project background and scope and defines the QRS. The document also presents an overview of the Logistics Management Institute (LMI) facility that supports the QRS, and it includes a summary of the planned additions to the QRS in FY 1998. The document has five appendices.

Author

Logistics Management; Systems Analysis; Data Bases; Aircraft Control; Aircraft Safety

19980137652 NASA Ames Research Center, Moffett Field, CA USA

Computational Study of Surface Tension and Wall Adhesion Effects on an Oil Film Flow Underneath an Air Boundary Layer

Celic, Alan, Technische Hochschule, Germany; Zilliac, Gregory G., NASA Ames Research Center, USA; May 1998; 50p; In English

Contract(s)/Grant(s): RTOP 519-20-22

Report No.(s): NASA/TM-1998-112230; NAS 1.15:112230; A-98-10955; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The fringe-imaging skin friction (FISF) technique, which was originally developed by D. J. Monson and G. G. Mateer at Ames Research Center and recently extended to 3-D flows, is the most accurate skin friction measurement technique currently available. The principle of this technique is that the skin friction at a point on an aerodynamic surface can be determined by measuring the time-rate-of-change of the thickness of an oil drop placed on the surface under the influence of the external air boundary layer. Lubrication theory is used to relate the oil-patch thickness variation to shear stress. The uncertainty of FISF measurements is estimated to be as low as 4 percent, yet little is known about the effects of surface tension and wall adhesion forces on the measured results. A modified version of the free-surface Navier-Stokes solver RIPPLE, developed at Los Alamos National Laboratories, was used to compute the time development of an oil drop on a surface under a simulated air boundary layer. RIPPLE uses the volume of fluid method to track the surface and the continuum surface force approach to model surface tension and wall adhesion effects. The development of an oil drop, over a time period of approximately 4 seconds, was studied. Under the influence of shear imposed by an air boundary layer, the computed profile of the drop rapidly changes from its initial circular-arc shape to a wedge-like shape. Comparison of the time-varying oil-thickness distributions computed using RIPPLE and also computed using a greatly simplified numerical model of an oil drop equation which does not include surface tension and wall adhesion effects) was used to evaluate the effects of surface tension on FISF measurement results. The effects of surface tension were found to be small but not necessarily negligible in some cases.

Author

Oils; Interfacial Tension; Friction Measurement; Adhesion; Control Surfaces; Boundary Layers; Computational Fluid Dynamics; Skin Friction

19980137655 Logistics Management Inst., McLean, VA USA

Air Cargo Operations Cost Database ***Final Report***

Johnson, Jesse P., NASA Langley Research Center, USA; Gaier, Eric M., Logistics Management Inst., USA; Apr. 1998; 138p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207655; NAS 1.26:207655; LMI-NS606S1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The United State, and much of the industrialized world, is in the midst of a tremendous period of growth in air traffic services. One section that has experienced particularly strong growth is the air cargo industry. Over the past 10 years, world-wide air cargo traffic has grown at an average annual rate 8.6 percent. Furthermore, it is generally accepted that his phenomenal growth in air cargo traffic will continue through at least the year 2005. Such sustained growth will undoubtedly impact the demand for cargo aircraft. A primary motivation for this study is to address the questions of how large this impact on demand for cargo aircraft will be, and what proportion of the demand for cargo aircraft is likely to be satisfied by new cargo aircraft. to assist NASA in the analysis of these and related issues, we built a set of integrated mathematical models that (1) estimate the direct operation costs associated with air cargo operations, (2) predict the future volume of air cargo traffic, and (3) estimate the future fleet sizes and composition necessary to meet the predicted growth rates.

Author

Air Cargo; Data Bases; Cost Reduction; Air Transportation

19980174903 Draper (Charles Stark) Lab., Inc., Cambridge, MA USA

Reliability Modeling Methodology for Independent Approaches on Parallel Runways Safety Analysis ***Final Report***

Babcock, P., Draper (Charles Stark) Lab., Inc., USA; Schor, A., Draper (Charles Stark) Lab., Inc., USA; Rosch, G., Draper (Charles Stark) Lab., Inc., USA; Apr. 1998; 48p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207660; NAS 1.26:207660; NS605S2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is an adjunct to the final report An Integrated Safety Analysis Methodology for Emerging Air Transport Technologies. That report presents the results of our analysis of the problem of simultaneous but independent, approaches of two aircraft on parallel runways (independent approaches on parallel runways, or IAPR). This introductory chapter presents a brief overview and perspective of approaches and methodologies for performing safety analyses for complex systems. Ensuing chapter provide the technical details that underlie the approach that we have taken in performing the safety analysis for the IAPR concept.

Author

Air Transportation; Runways; Safety; Air Traffic

19980185794 Logistics Management Inst., McLean, VA USA

Terminal Area Productivity Airport Wind Analysis and Chicago O'Hare Model Description ***Final Report***

Hemm, Robert, Logistics Management Inst., USA; Shapiro, Gerald, Logistics Management Inst., USA; Apr. 1998; 32p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207662; NAS 1.26:207662; NS707S1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes two results from a continuing effort to provide accurate cost-benefit analyses of the NASA Terminal Area Productivity (TAP) program technologies. Previous tasks have developed airport capacity and delay models and completed preliminary cost benefit estimates for TAP technologies at 10 U.S. airports. This task covers two improvements to the capacity and delay models. The first improvement is the completion of a detailed model set for the Chicago O'Hare (ORD) airport. Previous analyses used a more general model to estimate the benefits for ORD. This paper contains a description of the model details with results corresponding to current conditions. The second improvement is the development of specific wind speed and direction criteria for use in the delay models to predict when the Aircraft Vortex Spacing System (AVOSS) will allow use of reduced landing separations. This paper includes a description of the criteria and an estimate of AVOSS utility for 10 airports based on analysis of 35 years of weather data.

Author

Airports; Vortices; Wind Velocity; Spacing

19980185795 Logistics Management Inst., McLean, VA USA

An Integrated Safety Analysis Methodology for Emerging Air Transport Technologies ***Final Report***

Kostiuk, Peter F., Logistics Management Inst., USA; Adams, Milton B., Draper (Charles Stark) Lab., Inc., USA; Allinger, Deborah F., Draper (Charles Stark) Lab., Inc., USA; Rosch, Gene, Draper (Charles Stark) Lab., Inc., USA; Kuchar, James, Massachusetts Inst. of Tech., USA; Apr. 1998; 66p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207661; NAS 1.26:207661; NS605S1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The continuing growth of air traffic will place demands on NASA's Air Traffic Management (ATM) system that cannot be accommodated without the creation of significant delays and economic impacts. to deal with this situation, work has begun to develop new approaches to providing a safe and economical air transportation infrastructure. Many of these emerging air transport technologies will represent radically new approaches to ATM, both for ground and air operations.

Author

Air Transportation; Air Traffic Control; Management Systems; Safety

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19980137574 NASA Langley Research Center, Hampton, VA USA

Evaluation of Gritting Strategies for High Angle of Attack Using Wind Tunnel and Flight Test Data for the F/A-18

Hall, Robert M., NASA Langley Research Center, USA; Erickson, Gary E., NASA Langley Research Center, USA; Fox, Charles H., Jr., NASA Langley Research Center, USA; Banks, Daniel W., NASA Dryden Flight Research Center, USA; Fisher, David F., NASA Dryden Flight Research Center, USA; May 1998; 122p; In English

Contract(s)/Grant(s): RTOP 505-68-30-03

Report No.(s): NASA/TP-1998-207670; NAS 1.60.207670; L-17562; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A subsonic study of high-angle-of-attack gritting strategies was undertaken with a 0.06-scale model of the F/A-18, which was assumed to be typical of airplanes with smooth-sided forebodies. This study was conducted in the Langley 7- by 10-Foot High-Speed Tunnel and was intended to more accurately simulate flight boundary layer characteristics on the model in the wind tunnel than would be possible by using classical, low-angle-of-attack gritting on the fuselage. Six-component force and moment data were taken with an internally mounted strain-gauge balance, while pressure data were acquired by using electronically scanned pressure transducers. Data were taken at zero sideslip over an angle-of-attack range from 0 deg to 40 deg and, at selected angles of attack, over sideslip angles from -10 deg to 10 deg. Free-stream Mach number was fixed at 0.30, which resulted in a Reynolds number, based on mean aerodynamic chord, of 1.4 x 10(exp 6). Pressure data measured over the forebody and leading-edge extensions are compared to similar pressure data taken by a related NASA flight research program by using a specially instrumented F/A-18, the High-Alpha Research Vehicle (HARV). Preliminary guidelines for high-angle-of-attack gritting strategies are given.

Author

Angle of Attack; Flight Tests; Wind Tunnel Tests; Flight Characteristics; Boundary Layers; F-18 Aircraft

19980137606 Boeing Co., Saint Louis, MO USA

Euler Technology Assessment for Preliminary Aircraft Design-Unstructured/Structured Grid NASTD Application for Aerodynamic Analysis of an Advanced Fighter/Tailless Configuration

Michal, Todd R., Boeing Co., USA; Mar. 1998; 54p; In English

Contract(s)/Grant(s): NAS1-20342; RTOP 522-22-11-01

Report No.(s): NASA/CR-1998-206947; NAS 1.26:206947; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study supports the NASA Langley sponsored project aimed at determining the viability of using Euler technology for preliminary design use. The primary objective of this study was to assess the accuracy and efficiency of the Boeing, St. Louis unstructured grid flow field analysis system, consisting of the MACGS grid generation and NASTD flow solver codes. Euler solutions about the Aero Configuration/Weapons Fighter Technology (ACWFT) 1204 aircraft configuration were generated. Several variations of the geometry were investigated including a standard wing, cambered wing, deflected elevon, and deflected body flap. A wide range of flow conditions, most of which were in the non-linear regimes of the flight envelope, including variations in speed

(subsonic, transonic, supersonic), angles of attack, and sideslip were investigated. Several flowfield non-linearities were present in these solutions including shock waves, vortical flows and the resulting interactions. The accuracy of this method was evaluated by comparing solutions with test data and Navier-Stokes solutions. The ability to accurately predict lateral-directional characteristics and control effectiveness was investigated by computing solutions with sideslip, and with deflected control surfaces. Problem set up times and computational resource requirements were documented and used to evaluate the efficiency of this approach for use in the fast paced preliminary design environment.
Author
Computational Fluid Dynamics; Euler Equations of Motion; Aircraft Design; Cambered Wings; Controllability; Directional Control; Fighter Aircraft; Navier-Stokes Equation; Sideslip; Tailless Aircraft

19980151079 NASA Langley Research Center, Hampton, VA USA
Integration of a CAD System Into an MDO Framework
Townsend, J. C., NASA Langley Research Center, USA; Samareh, J. A., Computer Sciences Corp., USA; Weston, R. P., NASA Langley Research Center, USA; Zorumski, W. E., NASA Langley Research Center, USA; May 1998; 12p; In English; Optimization in Industry, 23-27 Mar. 1997, Palm Coast, FL, USA
Contract(s)/Grant(s): RTOP 509-10-11-01
Report No.(s): NASA/TM-1998-207672; NAS 1.15:207672; L-17726; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Langley has developed a heterogeneous distributed computing environment, called the Framework for Inter-disciplinary Design Optimization, or FIDO. Its purpose has been to demonstrate framework technical feasibility and usefulness for optimizing the preliminary design of complex systems and to provide a working environment for testing optimization schemes. Its initial implementation has been for a simplified model of preliminary design of a high-speed civil transport. Upgrades being considered for the FIDO system include a more complete geometry description, required by high-fidelity aerodynamics and structures codes and based on a commercial Computer Aided Design (CAD) system. This report presents the philosophy behind some of the decisions that have shaped the FIDO system and gives a brief case study of the problems and successes encountered in integrating a CAD system into the FEDO framework.
Author
Multidisciplinary Design Optimization; Computer Aided Design; Complex Systems

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980137603 Sverdrup Technology, Inc., Arnold AFS, TN USA
Economic Effects of Increased Control Zone Sizes in Conflict Resolution
Datta, Koushik, Sverdrup Technology, Inc., USA; Apr. 1998; 20p; In English
Contract(s)/Grant(s): NAS2-13767
Report No.(s): NASA/CR-1998-207889; NAS 1.26:207889; A-9810716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology for estimating the economic effects of different control zone sizes used in conflict resolutions between aircraft is presented in this paper. The methodology is based on estimating the difference in flight times of aircraft with and without the control zone, and converting the difference into a direct operating cost. Using this methodology the effects of increased lateral and vertical control zone sizes are evaluated.
Author
Operating Costs; Economics; Methodology

19980137659 National Transportation Safety Board, Office of Judges, Washington, DC USA
National Transportation Safety Board Transportation Initial Decisions and Board Opinions and Orders Adopted and Issued During the Month of May 1996
May 1996; 470p; In English
Report No.(s): PB96-916705; NTSB/IDB00-96/05; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for May 1996.
NTIS
Air Transportation; Safety Management

19980137711 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Transportation Initial Decisions and Board Opinions and Orders Adopted and Issued During the Month of June 1996
Jun. 1996; 455p; In English
Report No.(s): PB96-916706; NTSB/IDBOO-96/06; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche
This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for June 1996.
NTIS
Safety Management; Transportation

19980137713 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aircraft Accident Report: Collision with Trees on Final Approach, American Airlines Flight 1572, McDonnell Douglas MD-83, N566AA, East Granby, Connecticut, November 12, 1995
Nov. 13, 1996; 135p; In English
Report No.(s): PB96-910405; NTSB/AAR-96/05; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This report explains the accident involving American Airlines flight 1572, an MD-83 airplane, which was substantially damaged when it impacted trees in East Granby, Connecticut, while on approach to runway 15 at Bradley International Airport, Windsor Locks, Connecticut, on November 12, 1995. Safety issues in the report include tower shutdown procedures, non-precision approach flight procedures, precipitous terrain and obstruction identification during approach design, the issuance of altimeter settings by air traffic control, low level windshear system maintenance and recertification, and emergency evacuation issues.
NTIS
Air Transportation; Aircraft Accident Investigation; Safety Management; Commercial Aircraft; Collisions

19980147976 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board: Transportation Initial Decisions and Board Opinions and Orders Adopted and Issued During the Month of July 1996
Jul. 1996; 574p; In English
Report No.(s): PB96-916707; NTSB/IDBOO-96/07; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche
This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for July 1996.
NTIS
Air Transportation; Safety Management

19980148010 NASA Dryden Flight Research Center, Edwards, CA USA
Using Engine Thrust for Emergency Flight Control: MD-11 and B-747 Results
Burcham, Frank W., Jr., NASA Dryden Flight Research Center, USA; Maine, Trindel A., NASA Dryden Flight Research Center, USA; Burken, John J., NASA Dryden Flight Research Center, USA; Bull, John, Caelum Research Corp., USA; May 1998; 32p; In English; 43rd; Aviation Safety Issues: Gas Turbine and Aeroengine Technical Congress Exposition and Users Symposium, 2-5 Jun. 1998, Stockholm, Sweden; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 522-15-34
Report No.(s): NASA/TM-1998-206552; NAS 1.15:206552; H-2232; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
With modern digital control systems, using engine thrust for emergency flight control to supplement or replace failed aircraft normal flight controls has become a practical consideration. The NASA Dryden Flight Research Center has developed a propulsion-controlled aircraft (PCA) system in which computer-controlled engine thrust provides emergency flight control. An F-15 and an MD-11 airplane have been landed without using any flight control surfaces. Preliminary studies have also been conducted that show that engines on only one wing can provide some flight control capability if the lateral center of gravity can be shifted toward the side of the airplane that has the operating engine(s). Simulator tests of several airplanes with no flight control surfaces operating and all engines out on the left wing have all shown positive control capability within the available range of lateral center-

of-gravity offset. Propulsion-controlled aircraft systems that can operate without modifications to engine control systems, thus allowing PCA technology to be installed on less capable airplanes or at low cost, are also desirable. Further studies have examined simplified 'PCA Lite' and 'PCA Ultralite' concepts in which thrust control is provided by existing systems such as auto-throttles or a combination of existing systems and manual pilot control.
Author
Boeing 747 Aircraft; MD 11 Aircraft; Manual Control; Thrust Control; Numerical Control; Controllability; Aircraft Control; Emergencies; Flight Control

19980163014 George Washington Univ., Joint Inst. for Advancement of Flight Sciences, Hampton, VA USA
An Investigation of Candidate Sensor-Observable Wake Vortex Strength Parameters for the NASA Aircraft Vortex Spacing System (AVOSS)
Tatnall, Chistopher R., George Washington Univ., USA; Mar. 1998; 42p; In English
Contract(s)/Grant(s): NCC1-24; RTOP 538-04-11-11
Report No.(s): NASA/CR-1998-206933; NAS 1.26:206933; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The counter-rotating pair of wake vortices shed by flying aircraft can pose a threat to ensuing aircraft, particularly on landing approach. to allow adequate time for the vortices to disperse/decay, landing aircraft are required to maintain certain fixed separation distances. The Aircraft Vortex Spacing System (AVOSS), under development at NASA, is designed to prescribe safe aircraft landing approach separation distances appropriate to the ambient weather conditions. A key component of the AVOSS is a ground sensor, to ensure, safety by making wake observations to verify predicted behavior. This task requires knowledge of a flowfield strength metric which gauges the severity of disturbance an encountering aircraft could potentially experience. Several proposed strength metric concepts are defined and evaluated for various combinations of metric parameters and sensor line-of-sight elevation angles. Representative populations of generating and following aircraft types are selected, and their associated wake flowfields are modeled using various wake geometry definitions. Strength metric candidates are then rated and compared based on the correspondence of their computed values to associated aircraft response values, using basic statistical analyses.
Author
Aircraft Landing; Aircraft Performance; Elevation Angle; Flight Characteristics; Flow Distribution; Systems Engineering

19980169237 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Transportation Initial Decisions and Board Opinions and Orders: Adopted and Issued During the Month of September 1996
Sep. 1996; 247p; In English
Report No.(s): PB96-916709; NTSB/IDBOO-96/09; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for September 1996.
NTIS
Air Transportation; Accident Prevention; Safety Management

19980169238 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Transportation Initial Decisions and Board Opinions and Orders: Adopted and Issued During the Month of August 1996
Aug. 1996; 423p; In English
Report No.(s): PB96-916708; NTSB/IDBOO-96/08; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche
This publication contains all Judge Initial Decisions and Board Opinions and Orders in Safety Enforcement and Seaman Enforcement Cases for August 1996.
NTIS
Air Transportation; Safety Management; Flight Safety

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19980137678 European Organization for the Safety of Air Navigation, Bretigny-sur-Orge, France
AKARD: Identification of Available Knowledge and Identification of Required System Research and Development (SRD): Answer Document and Required SRD Document
Apr. 1996; 117p; In English
Report No.(s): PB97-101117; EEC-298; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report summarizes the results of the work completed within the EUROCONTROL project 'AKARD - Identification of Available Knowledge and Required SRD'. The work was carried out to identify that system research and development which is still required to support the implementation of satellite navigation in Europe in a safe and cost effective manner. This objective corresponds to Steps III and IV of the work methodology which was adopted by the EUROCONTROL SRD Task Force in its SRD Action Plan. This review has resulted in the identification of a list of required SRD items. It has provided the basis for further detailed discussions within the SRD TF to continue its development of the SRD Action Plan via the definition and specification of SRD projects.
NTIS
Global Positioning System; Satellite Navigation Systems; Systems Engineering; Research and Development; Cost Effectiveness; Air Traffic Control

19980148027 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A GPS Code Tracking Receiver Design for Multipath Mitigation Using Maximum Likelihood Estimation
Baier, Fred P., Air Force Inst. of Tech., USA; Dec. 1997; 135p; In English
Report No.(s): AD-A336672; AFIT/GE/ENG/97D-18; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The NAVSTAR Global Positioning System (GPS) is currently used in many applications requiring precise positioning data. Improving the precise positioning information requires the removal of errors that perturb the received signals. The errors introduced by multiple propagation channels, termed multipath, are not easily removed. These channels are caused by reflective surfaces near the receiver. As such, multipath is uncorrelated between receivers and, thus, cannot be removed through differencing techniques. This thesis investigates a GPS code tracking loop design which uses maximum likelihood (ML) estimation to determine amplitude and phase information of the multipath signal which are used to adjust code tracking to account for multipath effects. Analysis of the operations that govern this design for the case of a single reflection shows that it has no steady state tracking error. Results of simulations indicate that the code tracking loop, in conjunction with the MLE, mitigate the effects of multipath and improves code tracking performance over the narrow correlator NCDLL for most scenarios analyzed. Overall results of simulations indicate that the implementation of the maximum likelihood estimator (MLE) in conjunction with the code tracking loop has the potential to enhance code tracking performance over that offered by the narrow correlator NCDLL in a GPS environment.
DTIC
Global Positioning System; Multipath Transmission; Finite Difference Theory; Navstar Satellites

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980137620 National Aerospace Lab., Airframe Div., Tokyo, Japan
Residual Strength Analysis of a Cracked Stiffened Panel with Stochastic Factors in Fastener Flexibility
Shoji, H., National Aerospace Lab., Japan; Feb. 1996; 14p; In English
Report No.(s): PB96-211289; NAL/TR-1283T; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report, a residual strength analysis of a cracked stiffened panel was conducted on the basis of the displacement compatibility method, which is generally used as a handy tool. Stochastic factors in fastener flexibility are considered in the analysis by Monte Carlo simulation. The report outlines the displacement compatibility method, a method of taking in stochastic factors into

account, some results of differences in stochastic distribution models in fastener flexibility, and some results of the analysis. The author shows that the stochastic flexibility coefficients in rivet fastening affect the residual strength estimation of a cracked stiffened panel considerably.
NTIS
Monte Carlo Method; Residual Strength; Fasteners; Aircraft Construction Materials

19980147989 NERAC, Inc., Tolland, CT USA
Aircraft Landing Brakes. (Latest citations from the NTIS Bibliographic Database)
Mar. 1998; In English
Report No.(s): PB98-853492; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Hardcopy, Microfiche

The bibliography contains citations concerning the design, development, and applications of aircraft braking systems. Topics include a discussion of antiskid/antilocking braking systems, disc brakes, and properties of brakes and tires during braking and cornering of the aircraft. The effects of friction, wear, material composition, and weather conditions on the performance of aircraft braking systems are also presented. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Design Analysis; Product Development; Aerodynamic Brakes

19980169231 NASA Dryden Flight Research Center, Edwards, CA USA
Wingless Flight: The Lifting Body Story, *1963-1975*
Reed, R. Dale, NASA Dryden Flight Research Center, USA; Lister, Darlene, Editor, NASA Dryden Flight Research Center, USA; Huntley, J. D., Editor, NASA Dryden Flight Research Center, USA; 1997; 262p; In English
Report No.(s): NASA/SP-4220; NAS 1.21:4220; ISBN 0-16-049390-0; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Wingless Flight tells the story of the most unusual flying machines ever flown, the lifting bodies. It is my story about my friends and colleagues who committed a significant part of their lives in the 1960s and 1970s to prove that the concept was a viable one for use in spacecraft of the future. This story, filled with drama and adventure, is about the twelve-year period from 1963 to 1975 in which eight different lifting-body configurations flew. It is appropriate for me to write the story, since I was the engineer who first presented the idea of flight-testing the concept to others at the NASA Flight Research Center. Over those twelve years, I experienced the story as it unfolded day by day at that remote NASA facility northeast of los Angeles in the bleak Mojave Desert. Benefits from this effort immediately influenced the design and operational concepts of the winged NASA Shuttle Orbiter. However, the full benefits would not be realized until the 1990s when new spacecraft such as the X-33 and X-38 would fully employ the lifting-body concept. A lifting body is basically a wingless vehicle that flies due to the lift generated by the shape of its fuselage. Although both a lifting reentry vehicle and a ballistic capsule had been considered as options during the early stages of NASA's space program, NASA initially opted to go with the capsule. A number of individuals were not content to close the book on the lifting-body concept. Researchers including Alfred Eggers at the NASA Ames Research Center conducted early wind-tunnel experiments, finding that half of a rounded nose-cone shape that was flat on top and rounded on the bottom could generate a lift-to-drag ratio of about 1.5 to 1. Eggers' preliminary design sketch later resembled the basic M2 lifting-body design. At the NASA Langley Research Center, other researchers toyed with their own lifting-body shapes. Meanwhile, some of us aircraft-oriented researchers at the, NASA Flight Research Center at Edwards Air Force Base (AFB) in California were experiencing our own fascination with the lifting-body concept. A model-aircraft builder and private pilot on my own time, I found the lifting-body idea intriguing. I built a model based on Eggers' design, tested it repeatedly, made modifications in its control and balance characteristics along the way, then eventually presented the concept to others at the Center, using a film of its flights that my wife, Donna and I had made with our 8-mm home camera.
Author
Aircraft Models; Flight Tests; Shapes; Nose Cones; Lifting Bodies; Wings

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19980137599 NASA Lewis Research Center, Cleveland, OH USA
Propulsion System for Very High Altitude Subsonic Unmanned Aircraft
Bents, David J., NASA Lewis Research Center, USA; Mockler, Ted, NASA Lewis Research Center, USA; Maldonado, Jaime, NASA Lewis Research Center, USA; Harp, James L., Jr., Thermo Mechanical Systems Co., USA; King, Joseph F., Thermo Mechanical Systems Co., USA; Schmitz, Paul C., Power Computing Solutions, Inc., USA; Apr. 1998; 20p; In English; Aerospace Power Systems 1998, 21-23 Apr. 1998, Williamsburg, VA, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Contract(s)/Grant(s): RTOP 529-10-13
Report No.(s): NASA/TM-1998-206636; NAS 1.15:206636; E-11101; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper explains why a spark ignited gasoline engine, intake pressurized with three cascaded stages of turbocharging, was selected to power NASA's contemplated next generation of high altitude atmospheric science aircraft. Beginning with the most urgent science needs (the atmospheric sampling mission) and tracing through the mission requirements which dictate the unique flight regime in which this aircraft has to operate (subsonic flight at greater then 80 kft) we briefly explore the physical problems and constraints, the available technology options and the cost drivers associated with developing a viable propulsion system for this highly specialized aircraft. The paper presents the two available options (the turbojet and the turbocharged spark ignited engine) which are discussed and compared in the context of the flight regime. We then show how the unique nature of the sampling mission, coupled with the economic considerations pursuant to aero engine development, point to the spark ignited engine as the only cost effective solution available. Surprisingly, this solution compares favorably with the turbojet in the flight regime of interest. Finally, some remarks are made about NASA's present state of development, and future plans to flight demonstrate the three stage turbocharged powerplant.
Author
Propulsion; Pilotless Aircraft; Turbojet Engines; Air Sampling; Cost Effectiveness; High Altitude

19980147987 United Technologies Research Center, Pratt & Whitney, East Hartford, CT USA
Turbulent Radiation Effects in HSCT Combustor Rich Zone ***Final Report***
Hall, Robert J., United Technologies Research Center, USA; Vranos, Alexander, Connecticut Univ., USA; Yu, Weiduo, Connecticut Univ., USA; Mar. 1998; 78p; In English
Contract(s)/Grant(s): NAS3-26618; RTOP 537-05-20
Report No.(s): NASA/CR-1998-206532; NAS 1.26:206532; E-11021; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A joint UTRC-University of Connecticut theoretical program was based on describing coupled soot formation and radiation in turbulent flows using stretched flamelet theory. This effort was involved with using the model jet fuel kinetics mechanism to predict soot growth in flamelets at elevated pressure, to incorporate an efficient model for turbulent thermal radiation into a discrete transfer radiation code, and to couple die soot growth, flowfield, and radiation algorithm. The soot calculations used a recently developed opposed jet code which couples the dynamical equations of size-class dependent particle growth with complex chemistry. Several of the tasks represent technical firsts; among these are the prediction of soot from a detailed jet fuel kinetics mechanism, the inclusion of pressure effects in the soot particle growth equations, and the inclusion of the efficient turbulent radiation algorithm in a combustor code.
Author
Combustion Chambers; Civil Aviation; Jet Engine Fuels; Supersonic Transports; Thermal Radiation; Turbulent Flow

19980148006 NYMA, Inc., Brook Park, OH USA
PSP Measurement of Stator Vane Surface Pressures in a High Speed Fan ***Final Report***
Lepicovsky, Jan, NYMA, Inc., USA; Apr. 1998; 14p; In English; 43rd; Gas Turbine and Aeroengine, 2-5 Jun. 1998, Stockholm, Sweden; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS3-27186; RTOP 523-36-13
Report No.(s): NASA/CR-1998-207403; E-11150; NAS 1.26:207403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents measurements of static pressures on the stator vane suction side of a high-speed single stage fan using the technique of pressure sensitive paint (PSP). The paper illustrates development in application of the relatively new experimental technique to the complex environment of internal flows in turbomachines. First, there is a short explanation of the physics of the PSP technique and a discussion of calibration methods for pressure sensitive paint in the turbomachinery environment. A description of the image conversion process follows. The recorded image of the stator vane pressure field is skewed due to the limited optical access and must be converted to the meridional plane projection for comparison with analytical predictions. The experimental results for seven operating conditions along an off-design rotational speed line are shown in a concise form, including performance map points, mindspan static tap pressure distributions, and vane suction side pressure fields. Then, a comparison between static tap and pressure sensitive paint data is discussed. Finally, the paper lists shortcomings of the pressure sensitive paint technology and lessons learned in this high-speed fan application.
Author
Turbomachinery; Static Pressure; Internal Flow; Stators

19980174934 NASA Marshall Space Flight Center, Huntsville, AL USA
The Control System for the X-33 Linear Aerospike Engine
Jackson, Jerry E., Boeing Co., USA; Espenschied, Erich, Boeing Co., USA; Klop, Jeffrey, Boeing Co., USA; 1998; 11p; In English
Contract(s)/Grant(s): NCC8-115
Report No.(s): NASA/CR-1998-207923; NAS 1.26:207923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The linear aerospike engine is being developed for single-stage -to-orbit (SSTO) applications. The primary advantages of a linear aerospike engine over a conventional bell nozzle engine include altitude compensation, which provides enhanced performance, and lower vehicle weight resulting from the integration of the engine into the vehicle structure. A feature of this integration is the ability to provide thrust vector control (TVC) by differential throttling of the engine combustion elements, rather than the more conventional approach of gimballing the entire engine. An analysis of the X-33 flight trajectories has shown that it is necessary to provide +/- 15% roll, pitch and yaw TVC authority with an optional capability of +/- 30% pitch at select times during the mission. The TVC performance requirements for X-33 engine became a major driver in the design of the engine control system. The thrust level of the X-33 engine as well as the amount of TVC are managed by a control system which consists of electronic, instrumentation, propellant valves, electro-mechanical actuators, spark igniters, and harnesses. The engine control system is responsible for the thrust control, mixture ratio control, thrust vector control, engine health monitoring, and communication to the vehicle during all operational modes of the engine (checkout, pre-start, start, main-stage, shutdown and post shutdown). The methodology for thrust vector control, the health monitoring approach which includes failure detection, isolation, and response, and the basic control system design are the topic of this paper. As an additional point of interest a brief description of the X-33 engine system will be included in this paper.
Author
X-33 Reusable Launch Vehicle; Control Systems Design; Aerospike Engines; Engine Control; Single Stage to Orbit Vehicles; Throttling; Thrust Control; Thrust Vector Control

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19980137712 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aircraft Accident Report: Ground Spoiler Activation in Flight/Hard Landing ValuJet Airlines Flight 558, Douglas D-9-32, N922VV, Nashville, Tennessee, January 7, 1996
Dec. 11, 1996; 183p; In English
Report No.(s): PB96-910407; NTSB/AAR-96/07; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The report explains the ground spoiler activation in flight and subsequent hard landing of ValuJet Airlines flight 558, N922VV, a Douglas DC-9-32 at Nashville International Airport, Nashville, Tennessee. The safety issues discussed in the report include the adequacy of ValuJet's operations and maintenance manuals, specifically winter operations nosegear shock strut servicing procedures; the adequacy of ValuJet's pilot training/crew resource management training programs; flightcrew actions/decisionmaking; the role of communications (flightcrew/flight attendants/operations/dispatch/air traffic control); ValuJet's flightcrew

pay schedules; Federal Aviation Administration (FAA) oversight of ValuJet; and the adequacy of Cockpit Voice Recorder (CVR) duration and procedures. Safety recommendations concerning these issues were made to the FAA and ValuJet Airlines.
NTIS
Commercial Aircraft; Aircraft Accident Investigation; Air Traffic Control; Decision Making; Flight Operations; Hard Landing; Safety Management

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19980137722 Federal Data Corp., Brook Park, OH USA
Drive System Enhancement in the NASA Lewis Research Center Supersonic Wind Tunnels ***Final Report***
Becks, Edward A., Federal Data Corp., USA; Jun. 1998; 12p; In English; 20th; Advanced Measurement and Ground Testing Technology Conference, 15-18 Jun. 1998, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-98022; RTOP 523-91-93
Report No.(s): NASA/CR-1998-207929; NAS 1.26:207929; E-11191; AIAA Paper 98-2886; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An overview of NASA Lewis' Aeropropulsion Wind Tunnel Productivity Improvements was presented at the 19th AIAA Advanced Measurement & Ground Testing Technology Conference. Since that time Lewis has implemented subsonic operation in their 10- by 10-Foot Supersonic Wind Tunnel as had been proven viable in the 8- by 6 and 9- by 15-Foot Wind Tunnel Complex and discussed at the aforementioned conference. In addition, two more years of data have been gathered to help quantify the true productivity increases in these facilities attributable to the drive system and operational improvements. This paper was invited for presentation at the 20th Advanced Measurement and Ground Testing Conference to discuss and quantify the productivity improvements in the 10- by 10 SWT since the implementation of less than full complement motor operation. An update on the increased productivity at the 8- by 6 and 9- by 15-Foot facility due to drive system enhancements will also be presented.
Author
Wind Tunnels; Productivity; Conferences

19980169236 NASA Lewis Research Center, Cleveland, OH USA
A Magnetic Suspension and Excitation System for Spin Vibration Testing of Turbomachinery Blades
Johnson, Dexter, NASA Lewis Research Center, USA; Brown, Gerald V., NASA Lewis Research Center, USA; Mehmed, Oral, NASA Lewis Research Center, USA; Apr. 1998; 12p; In English; 39th; Structures, Structural Dynamics and Materials Conference, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 523-22-13
Report No.(s): NASA/TM-1998-206976; NAS 1.15:206976; E-11128; AIAA Paper 98-1851; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Dynamic Spin Rig (DSR) is used to perform vibration tests of turbomachinery blades and components under spinning conditions in a vacuum. A heteropolar radial active magnetic bearing was integrated into the DSR to provide non-contact magnetic suspension and mechanical excitation of the rotor to induce turbomachinery blade vibrations. The magnetic bearing replaces one of the two existing conventional radial ball bearings. Prior operation of the DSR used two voice-coil type linear electromagnetic shakers which provided axial excitation of the rotor. The new magnetic suspension and excitation system has provided enhanced testing capabilities. Tests were performed at high rotational speeds for longer duration and higher vibration amplitudes. Some characteristics of the system include magnetic bearing stiffness values up to 60,000 lb./in., closed loop control bandwidth around 500 Hz, and multi-directional radial excitation of the rotor. This paper reports on the implementation and operation of this system and presents some test results using this system.
Author
Magnetic Suspension; Magnetic Bearings; Vibration; Turbomachinery; Ball Bearings

19980185833 NASA Lewis Research Center, Cleveland, OH USA

Baseline Calibration of the NASA Lewis Research Center 8-by 6-Foot Supersonic Wind Tunnel (1991 and 1992 Tests), *1991-1992*

Arrington, E. Allen, NYMA, Inc., USA; Pickett, Mark T., NASA Lewis Research Center, USA; Soeder, Ronald H., NASA Lewis Research Center, USA; Jan. 1998; 150p; In English

Contract(s)/Grant(s): NAS3-27186; RTOP 505-62-82

Report No.(s): NASA/TM-97-107431; NAS 1.15:107431; E-10688; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In 1992, flow quality improvements were made in the NASA Lewis Research Center 8- by 6-Foot Supersonic Wind Tunnel. Prior to these improvements, baseline test section calibration and flow-field data were recorded and will be compared with data collected following the facility improvements to gage their effectiveness. Baseline data were collected during two test entries (1991 and 1992) and indicated very good flow quality in the subsonic, transonic, and low supersonic regimes. However, flow quality degraded over the high supersonic operating range. This report documents the data and results from both baseline calibration test entries and describes the test hardware and test procedures. In addition, the development of the data analysis methodology is documented.

Author

Supersonic Wind Tunnels; Test Chambers; Calibrating; Flow Characteristics

10
ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19980137477 International Maritime Satellite Organization, London, UK

Inmarsat Aero-I Flight Trials

Locke, Richard, International Maritime Satellite Organization, UK; Sydor, John, Communications Research Centre, Canada; IMSC 1997; Jun. 1997, pp. 125-131; In English; Also announced as 19980137459; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Since 1990, Inmarsat has been providing the aviation community with global telephone, facsimile, and data services via satellite. The current Inmarsat aeronautical products, especially ”Aero-H”, have been very successful at addressing the communications needs of long-haul commercial aircraft. However, for smaller aircraft such as medium-haul jets, or business and commuter aircraft, the physical characteristics and cost of the equipment have traditionally made the prospect of on-board satellite communications impractical. In 1994 and 1995, Inmarsat held a series of meetings with the aeronautical satcoms industry to define the specifications for an evolutionary and practical satellite communications product which would satisfy the requirements of many segments of the aviation community. This study group, with the aid of extensive market research, determined that the new system should have the following features (compared to the current Aero-H product): reduced size and weight of both the internal and external equipment; reduced equipment cost; identical services as the current product (voice, fax, and data) but achieved with power and bandwidth savings; lower end user charges (per minute cost); backward compatibility with the existing system (in terms of network management and access protocols); and a clearly defined upgrade path which would allow users of the current system to take advantage of the new technologies. The result of this collaboration between Inmarsat and industry was the ”Aero-I” specification.

Author

Satellite Communication; Commuter Aircraft; Product Development; Flight Tests; Aeronautical Satellites; Aircraft Communication

19980137604 NASA Dryden Flight Research Center, Edwards, CA USA

Recent Flight Test Results of the Joint CIAM-NASA Mach 6.5 Scramjet Flight Program

Roudakov, Alexander S., Central Inst. of Aviation Motors, Russia; Semenov, Vyacheslav L., Central Inst. of Aviation Motors, Russia; Hicks, John W., NASA Dryden Flight Research Center, USA; Apr. 1998; 14p; In English; 8th; International Spaceplanes and Hypersonic Systems and Technology Conference, 27-30 Apr. 1998, Norfolk, VA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 242-33-02

Report No.(s): NASA/TP-1998-206548; NAS 1.60:206548; G-2243; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under a contract with NASA, a joint Central Institute of Aviation Motors (CIAM) and NASA team recently conducted the fourth flight test of a dual-mode scramjet aboard the CIAM Hypersonic Flying Laboratory, 'Kholod'. With an aim test Mach 6.5 objective, the successful launch was conducted at the Sary Shagan test range in central Kazakstan on February 12, 1998. Ground-launch, rocket boosted by a modified Russian SA5 missile, the redesigned scramjet was accelerated to a new maximum velocity greater than Mach 6.4. This launch allowed for the measurement of the fully supersonic combustion mode under actual flight conditions. The primary program objective was the flight-to-ground correlation of measured data with preflight analysis and wind-tunnel tests in Russia and potentially in the USA. This paper describes the development and objectives of the program as well as the technical details of the scramjet and SA5 redesign to achieve the Mach 6.5 aim test condition. An overview of the launch operation is also given. Finally, preliminary flight test results are presented and discussed.

Author

Supersonic Combustion Ramjet Engines; Supersonic Combustion; Missiles; Launching; Hypersonic Speed; Flight Tests; Airborne Equipment

19980137619 National Aerospace Lab., Tokyo, Japan

High-Altitude Pressure Measurement in the Orbital Re-Entry Experiment (OREX)

Matsuzaki, T., National Aerospace Lab., Japan; Inoue, Y., National Aerospace Lab., Japan; Apr. 1996; 24p; In English

Report No.(s): PB96-211404; NAL-TR-1287T; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The first Japanese Orbital Re-entry Experiment (OREX) that successfully flew was launched by the first flight of an H-II rocket on February 4, 1994, and was inserted into a circular orbit at about 450km. NAL took charge of the pressure measurement, as one of various measurement missions, from vacuum at high altitude down to an altitude of about 75km with a four-decade precision capacitive-type pressure transducer. These data can be used to predict the surface pressure and the ambient pressure in similar flights in the future. The data verified the real gas Computational Fluid Dynamics (CFD) codes through comparison with aerodynamic calculation results. This paper outlines the design, fabrication, performance tests, environmental tests, flight operation, flight data and their evaluation of high altitude pressure measurement systems.

NTIS

Computational Fluid Dynamics; Reentry Vehicles; Aerothermodynamics; Rarefied Gas Dynamics; Pressure Measurement; Flight Operations; Japanese Space Program

11
CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980163018 NASA Langley Research Center, Hampton, VA USA

Response of Composite Fuselage Sandwich Side Panels Subjected to Internal Pressure and Axial Tension

Rouse, Marshall, NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; Dopker, Bernard, Boeing Commercial Airplane Co., USA; Shah, Bharat, Lockheed Martin Aeronautical Systems, USA; 1998; 14p; In English; 35th; Structures, Structural Dynamics, and Materials Conference, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-1998-208191; NAS 1.15:208191; AIAA Paper 98-1708; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results from an experimental and analytical study of two composite sandwich fuselage side panels for a transport aircraft are presented. Each panel has two window cutouts and three frames and utilizes a distinctly different structural concept. These panels have been evaluated with internal pressure loads that generate biaxial tension loading conditions. Design limit load and design ultimate load tests have been performed on both panels. One of the sandwich panels was tested with the middle frame removed to demonstrate the suitability of this two-frame design for supporting the prescribed biaxial loading conditions with twice the initial frame spacing of 20 inches. A damage tolerance study was conducted on the two-frame panel by cutting a notch in the panel that originates at the edge of a cutout and extends in the panel hoop direction through the window-belt area. This panel with a notch was tested in a combined-load condition to demonstrate the structural damage tolerance at the design limit load condition. Both the sandwich panel designs successfully satisfied all desired load requirements in the experimental part of the study, and experimental results from the two-frame panel with and without damage are fully explained by the analytical results. The results

of this study suggest that there is potential for using sandwich structural concepts with greater than the usual 20-inches-wide frame spacing to further reduce aircraft fuselage structural weight.
Author
Composite Structures; Fuselages; Sandwich Structures; Axial Loads; Internal Pressure; Load Tests; Panels; Structural Analysis; Finite Element Method; Tensile Deformation; Critical Loading

19980185799 Iowa State Univ. of Science and Technology, Ames, IA USA
Comparison of CFC-114 and HFC-236ea Performance in Shipboard Vapor Compression Systems
Ray, D. T., Iowa State Univ. of Science and Technology, USA; Pate, M. B., Iowa State Univ. of Science and Technology, USA; Shapiro, H. N., Iowa State Univ. of Science and Technology, USA; Brna, T. G., Environmental Protection Agency, USA; 1998; 14p; In English; Halon Alternatives, 21-23 Oct. 1996, Washington, DC, USA
Contract(s)/Grant(s): EPA-CR820755-01-4
Report No.(s): PB98-140395; EPA/600/A-98/029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The paper gives results of a comparison of chlorofluorocarbon (CFC)-114 and hydrofluorocarbon (HFC)-236ea performance in shipboard vapor compression systems. A computer model was developed for comparing these two refrigerants in a simulated 125-ton (3.5-kW) centrifugal chiller system.
NTIS
Refrigerants; Centrifugal Compressors; Environmental Chemistry; Evaluation

12
ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980137511 EMS Technologies, Inc., Norcross, GA USA
A Ku-Band DBS Airborne Antenna System for Commercial Airlines
Prather, W. Horton, EMS Technologies, Inc., USA; IMSC 1997; Jun. 1997, pp. 355-356; In English; Also announced as 19980137459; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
Live video reception from direct broadcast system (DBS) satellites is being planned for future inflight entertainment systems. Some of the most challenging system requirements are those of the satellite tracking antenna which must provide high G/T required for reception of dual polarization, wideband compressed video signals, while also providing a low profile, accurate tracking, and low production cost. This paper describes the recent development of such a system by EMS Technologies, Inc. for use in commercial airline entertainment systems.
Author
Commercial Aircraft; Video Signals; Aircraft Antennas; Video Compression; Video Communication; Airborne Equipment

19980137531 University of South Australia, Inst. for Telecommunications Research, The Levels, Australia
A Mobile Satellite Modem for Helicopter Applications
Cowley, W. G., University of South Australia, Australia; Lavenant, M. P., University of South Australia, Australia; Zhang, W., Defence Science and Technology Organisation, Australia; Proceedings of the Fifth International Mobile Satellite Conference 1997; Jun. 1997, pp. 479-484; In English; Also announced as 19980137459
Contract(s)/Grant(s): DSTO-TO2059; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche
The paper describes a mobile satellite modem designed to provide flexible low-rate data and voice communications for helicopters via the L band transponder of the Australian domestic satellite. The project was constrained to use an existing low gain antenna on the helicopter. The resulting communications channel exhibits severe periodic signal fading due to rotor blade obstructions, plus the usual mobile satellite channel characteristics of low signal to noise ratio and large doppler variations. The paper describes how these difficulties were overcome by optimizing the modulation, channel coding and modem signal processing for this channel. The modem has been implemented with digital signal processors and designed to allow a variety of coding and processing algorithms to be tested at various data rates. In particular, this paper covers the following topics: the helicopter channel

magnitude and phase response, design of a pilot-symbol-assisted carrier phase recovery scheme and its performance relative to differential PSK (phase shift keying), frequency offset estimation and interleaved coding, and performance results for the modem. Author

Voice Communication; Helicopters; Modems; Channels (Data Transmission); Signal Processing; Mobile Communication Systems

19980137536 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

K/Ka-Band Aeronautical Experiments

Agan, Martin J., Jet Propulsion Lab., California Inst. of Tech., USA; Connally, Michael J., Jet Propulsion Lab., California Inst. of Tech., USA; Jedrey, Thomas C., Jet Propulsion Lab., California Inst. of Tech., USA; IMSC 1997; Jun. 1997, pp. 509-514; In English; Also announced as 19980137459; Sponsored in part by Geoff Haines-Stiles Productions, Inc. and WNET/New York; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper discusses a series of aeronautical experiments that utilize the Advanced Communication Technology Satellite (ACTS) Broadband Aeronautical Terminal (BAT). These experiments were designed to explore the uses of K and Ka-band for aeronautical applications. Planned experiments are also discussed.

Author

ACTS; Broadband; Extremely High Frequencies; Aeronautics; Experimentation

19980137663 Bassin d'Essais des Carenes, Chaussee-du-Vexin, France

Specific Applications of FLUENT in Naval Hydrodynamics

Berth, F., Bassin d'Essais des Carenes, France; Laurens, J. M., Bassin d'Essais des Carenes, France; 1996; 15p; In English; FLUENT, 20-21 Jun. 1996, London, UK

Report No.(s): PB96-212964; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of the Computational Fluid Dynamics division is to develop and implement various mathematical models and related codes in support of experimental work and research in the field of naval hydrodynamics. Main fields of research are Ship Resistance and Propulsion and Ship Maneuverability. Study aspects are: detailed flow around the hull, free surface evaluation, and fin and propeller performance. Two types of codes are used to compute flow: panel method codes based on the potential flow theory and RANS codes such as FLUENT. 3D RANS calculations in conjunction with panel methods are applied on a regular basis in the field of naval hydrodynamics.

NTIS

Computational Fluid Dynamics; Hydrodynamics; Maneuverability; Marine Propulsion; Propeller Efficiency; Hulls (Structures); Fins

19980137672 National Inst. of Standards and Technology, Intelligent Systems Div., Gaithersburg, MD USA

Advanced Deburring and Chamfering System (ADACS) ***Final Report***

Stouffer, K., National Inst. of Standards and Technology, USA; Russell, R., National Inst. of Standards and Technology, USA; Archacki, R., United Technologies Research Center, USA; Engel, T., United Technologies Research Center, USA; Dansereau, R., Pratt and Whitney Aircraft, USA; Oct. 1996; 68p; In English

Report No.(s): PB97-132138; NISTIR-5915; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper is the final report to the Navy describing the Advanced Deburring and Chamfering System (ADACS) project. The ADACS was a U.S. Navy MANTECH funded project to address the issues of automated deburring and chamfering of aircraft engine components manufactured from high strength alloy materials. United Technologies Research Center (UTRC), Pratt and Whitney, Sikorsky and Auburn University collaborated with NIST to develop the system.

NTIS

Engine Parts; Aircraft Engines; Robots; Computer Aided Manufacturing; Real Time Operation

19980151085 NASA Johnson Space Center, Houston, TX USA

An Approximate Axisymmetric Viscous Shock Layer Aeroheating Method for Three-Dimensional Bodies

Brykina, Irina G., Moscow State Univ., Russia; Scott, Carl D., NASA Johnson Space Center, USA; May 1998; 34p; In English

Report No.(s): NASA/TM-98-207890; NAS 1.15:207890; S-840; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A technique is implemented for computing hypersonic aeroheating, shear stress, and other flow properties on the windward side of a three-dimensional (3D) blunt body. The technique uses a 2D/axisymmetric flow solver modified by scale factors for a, corresponding equivalent axisymmetric body. Examples are given in which a 2D solver is used to calculate the flow at selected meridional planes on elliptic paraboloids in reentry flight. The report describes the equations and the codes used to convert the

body surface parameters into input used to scale the 2D viscous shock layer equations in the axisymmetric viscous shock layer code. Very good agreement is obtained with solutions to finite rate chemistry 3D thin viscous shock layer equations for a finite rate catalytic body.
Author
Flow Measurement; Axisymmetric Flow; Aerodynamic Heating; Parabolic Bodies; Hypersonics; Axisymmetric Bodies; Blunt Bodies

13
GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

19980137586 Dynamac Corp., Cocoa Beach, FL USA
Temporal, Spatial, and Diurnal Patterns in Avian Activity at the Shuttle Landing Facility, John F. Kennedy Space Center, Florida, USA
Larson, Vickie L., Dynamac Corp., USA; Rowe, Sean P., Dynamac Corp., USA; Breininger, David R., Dynamac Corp., USA; Nov. 1997; 50p; In English
Contract(s)/Grant(s): NAS10-12180
Report No.(s): NASA/TM-97-206644; NAS 1.15:206644; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Spatial and temporal patterns in bird abundance within the five-mile airspace at the Shuttle Landing Facility (SLF) on John F. Kennedy Space Center (KSC), Florida, USA were investigated for purposes of quantifying Bird Aircraft Strike Hazards (BASH). The airspace is surrounded by the Merritt Island National Wildlife Refuge (MINWR) which provides habitat for approximately 331 resident and migratory bird species. Potential bird strike hazards were greatest around sunrise and sunset for most avian taxonomic groups, including wading birds, most raptors, pelicans, gulls/terns, shorebirds, and passerines. Turkey Vultures and Black Vultures were identified as a primary threat to aircraft operations and were represented in 33% of the samples. Diurnal vulture activity varied seasonally with the development of air thermals in the airspace surrounding the SLF. Variation in the presence and abundance of migratory species was shown for American Robins, swallows, and several species of shorebirds. Analyses of bird activities provides for planning of avionics operations during periods of low-dsk and allows for risk minimization measures during periods of high-risk.
Author
Bird-Aircraft Collisions; Aircraft Hazards; Spatial Distribution; Temporal Distribution; Optimization; Flight Operations; Diurnal Variations

14
LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980169251 Federal Aviation Administration, Washington, DC USA
Federal Aviation Administration Human Factors Team Report on: Interfaces between Flightcrews and Modern Flight Deck Systems
Jun. 18, 1996; 203p; In English
Report No.(s): PB97-109615; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
This report is the result of a study of the interfaces between the flightcrew and the automated systems of highly automated airplanes. It primarily focuses on the interfaces that affect flight path management.
NTIS
Flight Crews; Human Factors Engineering; Automatic Pilots; Aircraft Pilots; Pilot Performance; Man Machine Systems; Automatic Flight Control

19980193183 NASA Ames Research Center, Moffett Field, CA USA
Human habitat positioning system for NASA's space flight environmental simulator
Caldwell, W. F., NASA Ames Research Center, USA; Tucker, J., Gates/Arrow Distributing, USA; Keas, P., Sverdrup Technology, Inc., USA; Fortieth Anniversary: Pioneering the Future; May 1998, pp. 367-381; In English; Also announced as 19980193156;

No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Artificial gravity by centrifugation offers an effective countermeasure to the physiologic deconditioning of chronic exposure to microgravity; however, the system requirements of rotational velocity, radius of rotation, and resultant centrifugal acceleration require thorough investigation to ascertain the ideal human-use centrifuge configuration. NASA's Space Flight Environmental Simulator (SFES), a 16-meter (52-foot) diameter, animal-use centrifuge, was recently modified to accommodate human occupancy. This paper describes the SFES Human Habitat Positioning System, the mechanism that facilitates radius of rotation variability and alignment of the centrifuge occupants with the artificial gravity vector.

Author

Environment Simulators; Space Habitats; Flight Simulators; Aerospace Environments; Physiological Effects; Microgravity; Human Centrifuges; Gravitational Physiology; Gravitational Effects; Space Environment Simulation

15
MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19980137578 Texas A&M Univ., College Station, TX USA

Combined Numerical/Analytical Perturbation Solutions of the Navier-Stokes Equations for Aerodynamic Ejector/Mixer Nozzle Flows ***Final Report***

DeChant, Lawrence Justin, Texas A&M Univ., USA; Apr. 1998; 222p; In English

Contract(s)/Grant(s): NGT-51244; RTOP 537-09-20

Report No.(s): NASA/CR-1998-207406; NAS 1.26:207406; E-11166; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

In spite of rapid advances in both scalar and parallel computational tools, the large number of variables involved in both design and inverse problems make the use of sophisticated fluid flow models impractical, With this restriction, it is concluded that an important family of methods for mathematical/computational development are reduced or approximate fluid flow models. In this study a combined perturbation/numerical modeling methodology is developed which provides a rigorously derived family of solutions. The mathematical model is computationally more efficient than classical boundary layer but provides important two-dimensional information not available using quasi-1-d approaches. An additional strength of the current methodology is its ability to locally predict static pressure fields in a manner analogous to more sophisticated parabolized Navier Stokes (PNS) formulations. to resolve singular behavior, the model utilizes classical analytical solution techniques. Hence, analytical methods have been combined with efficient numerical methods to yield an efficient hybrid fluid flow model. In particular, the main objective of this research has been to develop a system of analytical and numerical ejector/mixer nozzle models, which require minimal empirical input. A computer code, DREA Differential Reduced Ejector/mixer Analysis has been developed with the ability to run sufficiently fast so that it may be used either as a subroutine or called by an design optimization routine. Models are of direct use to the High Speed Civil Transport Program (a joint government/industry project seeking to develop an economically.viable U.S. commercial supersonic transport vehicle) and are currently being adopted by both NASA and industry. Experimental validation of these models is provided by comparison to results obtained from open literature and Limited Exclusive Right Distribution (LERD) sources, as well as dedicated experiments performed at Texas A&M. These experiments have been performed using a hydraulic/gas flow analog. Results of comparisons of DREA computations with experimental data, which include entrainment, thrust, and local profile information, are overall good. Computational time studies indicate that DREA provides considerably more information at a lower computational cost than contemporary ejector nozzle design models. Finally. physical limitations of the method, deviations from experimental data, potential improvements and alternative formulations are described. This report represents closure to the NASA Graduate Researchers Program. Versions of the DREA code and a user's guide may be obtained from the NASA Lewis Research Center.

Author

Nozzle Design; Mixers; Mixing Layers (Fluids); Jet Propulsion; Fluid Mechanics; Ejectors; Navier-Stokes Equation; Computer Programs; Supersonic Transports

19980151078 NASA Lewis Research Center, Cleveland, OH USA

Neural Network and Regression Approximations in High Speed Civil Transport Aircraft Design Optimization

Patniak, Surya N., Ohio Aerospace Inst., USA; Guptill, James D., NASA Lewis Research Center, USA; Hopkins, Dale A., NASA Lewis Research Center, USA; Lavelle, Thomas M., NASA Lewis Research Center, USA; Apr. 1998; 26p; In English

Contract(s)/Grant(s): RTOP 523-22-13
Report No.(s): NASA/TM-1998-206316; NAS 1.15:206316; E-10872; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Nonlinear mathematical-programming-based design optimization can be an elegant method. However, the calculations required to generate the merit function, constraints, and their gradients, which are frequently required, can make the process computational intensive. The computational burden can be greatly reduced by using approximating analyzers derived from an original analyzer utilizing neural networks and linear regression methods. The experience gained from using both of these approximation methods in the design optimization of a high speed civil transport aircraft is the subject of this paper. The Langley Research Center's Flight Optimization System was selected for the aircraft analysis. This software was exercised to generate a set of training data with which a neural network and a regression method were trained, thereby producing the two approximating analyzers. The derived analyzers were coupled to the Lewis Research Center's CometBoards test bed to provide the optimization capability. With the combined software, both approximation methods were examined for use in aircraft design optimization, and both performed satisfactorily. The CPU time for solution of the problem, which had been measured in hours, was reduced to minutes with the neural network approximation and to seconds with the regression method. Instability encountered in the aircraft analysis software at certain design points was also eliminated. On the other hand, there were costs and difficulties associated with training the approximating analyzers. The CPU time required to generate the input-output pairs and to train the approximating analyzers was seven times that required for solution of the problem.
Author
Nonlinear Programming; Neural Nets; Aircraft Design; National Aerospace Plane Program; Civil Aviation; Supersonic Transports

16
PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19980148001 NASA Lewis Research Center, Cleveland, OH USA
Refraction of Sound Emitted Near Solid Boundaries from a Sheared Jet
Dill, Loren H., AYT Corp., USA; Oyedrian, Ayo A., AYT Corp., USA; Krejsa, Eugene A., NASA Lewis Research Center, USA; May 1998; 48p; In English
Contract(s)/Grant(s): RTOP 537-05-21
Report No.(s): NASA/TM-1998-207421; NAS 1.15:207421; E-11178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A mathematical model is developed to describe the sound emitted from an arbitrary point within a turbulent flow near solid boundaries. A unidirectional, transversely sheared mean flow is assumed, and the cross-section of the cold jet is of arbitrary shape. The analysis begins with Lilley's formulation of aerodynamic noise and, depending upon the specific model of turbulence used, leads via Fourier analysis to an expression for the spectral density of the intensity of the far-field sound emitted from a unit volume of turbulence. The expressions require solution of a reduced Green's function of Lilley's equation as well as certain moving axis velocity correlations of the turbulence. Integration over the entire flow field is required in order to predict the sound emitted by the complete flow. Calculations are presented for sound emitted from a plugflow jet exiting a semi-infinite flat duct. Polar plots of the far-field directivity show the dependence upon frequency and source position within the duct. Certain model problems are suggested to investigate the effect of duct termination, duct geometry, and mean flow shear upon the far-field sound.
Author
Aerodynamic Noise; Sound Intensity; Fourier Analysis; Flow Distribution; Far Fields; Duct Geometry

19980148012 NASA Langley Research Center, Hampton, VA USA
Aeroacoustic Codes for Rotor Harmonic and BVI Noise. CAMRAD.Mod1/HIRES: Methodology and Users' Manual
Boyd, D. Douglas, Jr., Virginia Polytechnic Inst. and State Univ., USA; Brooks, Thomas F., NASA Langley Research Center, USA; Burley, Casey L., NASA Langley Research Center, USA; Jolly, J. Ralph, Jr., Jolly Development Corp., USA; Mar. 1998; 236p; In English
Contract(s)/Grant(s): RTOP 581-20-21-02
Report No.(s): NASA/TM-1998-207640; L-17697; NAS 1.26:207640; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This document details the methodology and use of the CAMRAD.Mod1/HIRES codes, which were developed at NASA Langley Research Center for the prediction of helicopter harmonic and Blade-Vortex Interaction (BVI) noise. CANMAD.Mod1 is a substantially modified version of the performance/trim/wake code CANMAD. High resolution blade loading is determined in post-processing by HIRES and an associated indicial aerodynamics code. Extensive capabilities of importance to noise prediction accuracy are documented, including a new multi-core tip vortex roll-up wake model, higher harmonic and individual blade control, tunnel and fuselage correction input, diagnostic blade motion input, and interfaces for acoustic and CFD aerodynamics codes. Modifications and new code capabilities are documented with examples. A users' job preparation guide and listings of variables and namelists are given.
Author
Aeroacoustics; Applications Programs (Computers); Blade Slap Noise; Blade-Vortex Interaction; Helicopters; Noise Prediction; Rotor Aerodynamics

19980193234 Bolt, Beranek, and Newman, Inc., Canoga Park, CA USA
Use of Airport Noise Complaint Files to Improve Understanding of Community Response to Aircraft Noise
Fidell, Sanford, Bolt, Beranek, and Newman, Inc., USA; Howe, Richard, Bolt, Beranek, and Newman, Inc., USA; Apr. 1998; 52p; In English
Contract(s)/Grant(s): NAS1-20101; RTOP 538-03-15-01
Report No.(s): NASA/CR-1998-207650; NAS 1.26:207650; BBN-8215; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study assessed the feasibility of using complaint information archived by modem airport monitoring systems to conduct quantitative analyses of the causes of aircraft noise complaints and their relationship to noise- induced annoyance. It was found that all computer-based airport monitoring systems provide at least rudimentary tools for performing data base searches by complainant name, address, date, time of day, and types of aircraft and complaints. Analyses of such information can provide useful information about longstanding concerns, such as the extent to which complaint rates are driven by objectively measurable aspects of aircraft operations; the degree to which changes in complaint rates can be predicted prior to implementation of noise mitigation measures; and the degree to which aircraft complaint information can be used to simplify and otherwise improve prediction of the prevalence of noise-induced annoyance in communities.
Author
Systems Analysis; Noise Pollution; Flight Operations; Computer Techniques; Airports; Aircraft Noise

Subject Term Index

Personal Author Index

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